



## Policy 10

### RETAINING WALLS

Retaining walls located on private property are the responsibility of the property owner. The property owner (or his representative) must ensure that the retaining wall is properly designed and constructed. The property owner is responsible for maintenance and repairs of all retaining walls on his property. Developers are not allowed to construct retaining walls of any size within public right-of-way or in areas that will be dedicated for public right-of-way.

All plans, profiles, cross-sections and calculations must be prepared and sealed by a registered professional engineer licensed to practice in the state of Tennessee. The professional engineer must have sufficient education and experience to design a retaining wall that ensures the safety of the general public. The professional engineer shall also have complete control of all aspects of the design and preparation of plans and calculations. Approval of necessary plans and calculations will not transfer or share responsibility of the retaining wall design to the City of Knoxville.

In order to obtain a Site Development Permit for construction of retaining walls 4 feet or taller on private property, the following information must be submitted to the Stormwater Engineering Division:

- A plan sheet that includes existing and proposed contours, drainage features, buildings, property lines, proposed wall locations, public easements, parking facilities and streets.
- A typical section showing wall and footing dimensions, backfill slopes, finished grade elevations, steel reinforcement details, weephole locations, and subsurface drainage systems.
- Engineering calculations for the design of the wall, noting all assumptions such as concrete and steel reinforcement strengths, soil parameters, surcharges, bearing pressures, safety factors for bearing capacity, overturning, and sliding. The minimum required factors of safety are as follows:

Bearing Capacity = 3.0

Overturning = 2.0

Sliding = 1.5

If the retaining wall on private property is 4 feet or taller and has the potential to affect public right-of-way, the following two additional requirements must be met:

- A geotechnical report must be included with the retaining wall design and calculations as part of the Site Development Permit submittal.
- A letter from a qualified Geotechnical Engineer must be included with the Development Certification submittal confirming that the backfill and foundation materials used in the actual construction meet the requirements of the original design.

The professional engineer is responsible for all aspects of the retaining wall design. The use of standard designs from reputable manufacturers is allowable and even encouraged, but the professional engineer who stamps the drawings and computations is responsible for the retaining wall design. Inadequate information from geotechnical investigations and reports will not excuse the engineer's responsibility or liability.

Third-Party Inspections – The Engineering Director may require a proposed retaining wall to be inspected by an independent geotechnical firm or engineer during the construction process. Typical criteria for walls which must receive third-party inspections may include:

- Vicinity to public streets and roads.
- Vicinity to permanent residences, such as houses, apartments, or condos.
- Modular construction, rather than cast-in-place concrete.
- Heights over 10' or located near steep slopes.
- Potential for groundwater or surface runoff problems.

The independent geotechnical firm or engineer will submit inspection reports at agreed-upon intervals based on the construction schedule, size and type of retaining wall, and types of soil testing involved. Inspection reports must demonstrate that the retaining wall is constructed safely and will function as designed. In some cases, construction modifications may be needed if the soil design parameters are insufficient.

Geotextile-Reinforced Walls – There have been several instances of geotextile-reinforced walls that have failed in the last few years on private property and public rights-of-way. It is suspected that insufficient soil compaction, poor backfill, and inadequate soil preparation are the chief culprits. The Engineering Department is very reluctant to allow these types of retaining walls on private property over 4' tall with the potential to affect public right-of-way or permanent residences. Geotextile-reinforced walls in these instances will be reviewed on a case-by-case basis. Performance bonds or other types of guarantees may be needed to ensure adequate maintenance and repair.

Here are some recommendations and advice concerning retaining wall design and construction:

- As an example for concrete gravity retaining walls, see TDOT standard detail EL-W-2 at: [www.tdot.state.tn.us/Chief\\_Engineer/engr\\_library/design/Std\\_Drwg\\_Eng.htm](http://www.tdot.state.tn.us/Chief_Engineer/engr_library/design/Std_Drwg_Eng.htm) This drawing shows typical features such as: weep holes, expansion joints, contraction joints, granular backfill, waterstops, and perforated drains.
- Where possible, design retaining walls so that vehicular traffic and construction equipment will not provide surcharge loading at the top of the walls. Surcharged loads cause a large increase in the construction cost of retaining walls. In addition, surcharged loads are hard to predict, hard to control and monitor, and cause repeated stress motions.
- In some types of walls, the factors of safety may not be clearly stated. However, the design engineer should carefully investigate all claims made by retaining wall manufacturers. The amount of expected settlement can be estimated based solely on the weight of materials and the soil properties.